

Atherosclerosis

Like water through a hose, blood flows through your arteries delivering oxygen and nutrients to your organs. When your arteries become clogged with fatty deposits (known as plaque), they lose their elasticity and narrow. This blocks or slows the smooth passage of blood.

Plaque is a sticky, yellow substance made up of fatty substances such as cholesterol, calcium, and waste products from your cells. Atherosclerosis is a slow, progressive condition that may begin as early as childhood. It can occur anywhere in the body but it usually affects large and medium sized arteries.

Causes

The causes of atherosclerosis are complicated and still not completely understood. Atherosclerosis is thought to start when the inner lining of the artery becomes damaged. The blood vessel wall reacts to this injury by depositing fatty substances, cholesterol, calcium and other substances on the inner lining of the artery. The result is a progressive thickening of the blood vessel wall. High blood pressure, high levels of cholesterol and triglycerides in the blood, and smoking can all contribute to the development of plaque.

Risk factors for atherosclerosis include diabetes, obesity, high blood cholesterol, consuming a high fat diet, or a family history of heart disease.

Symptoms

Sometimes atherosclerosis causes no symptoms until it is far enough advanced to block a large part of an important blood vessel. If the blockage occurs in an artery of the heart (coronary artery), it will cause angina (chest pain). As it progresses, atherosclerosis in the arteries of the heart may cause a heart attack, or if it develops in the brain, can cause a stroke.

Risks

If atherosclerosis blocks the flow of blood through your coronary arteries, you may develop coronary artery disease, which may lead to angina or a heart attack. If it blocks the arteries in your brain, it may lead to a stroke. It also can cause an aneurysm in the aorta (the largest artery that runs from the heart to the stomach) or in the brain (cerebral). An aneurysm is a weakened area in the wall of the blood vessel that fills up with blood and bulges. If an aneurysm grows large enough it can rupture, resulting in uncontrolled bleeding. A ruptured aneurysm is life-threatening and requires immediate medical treatment.

Diagnosis

Atherosclerosis can be diagnosed using:

Angiography

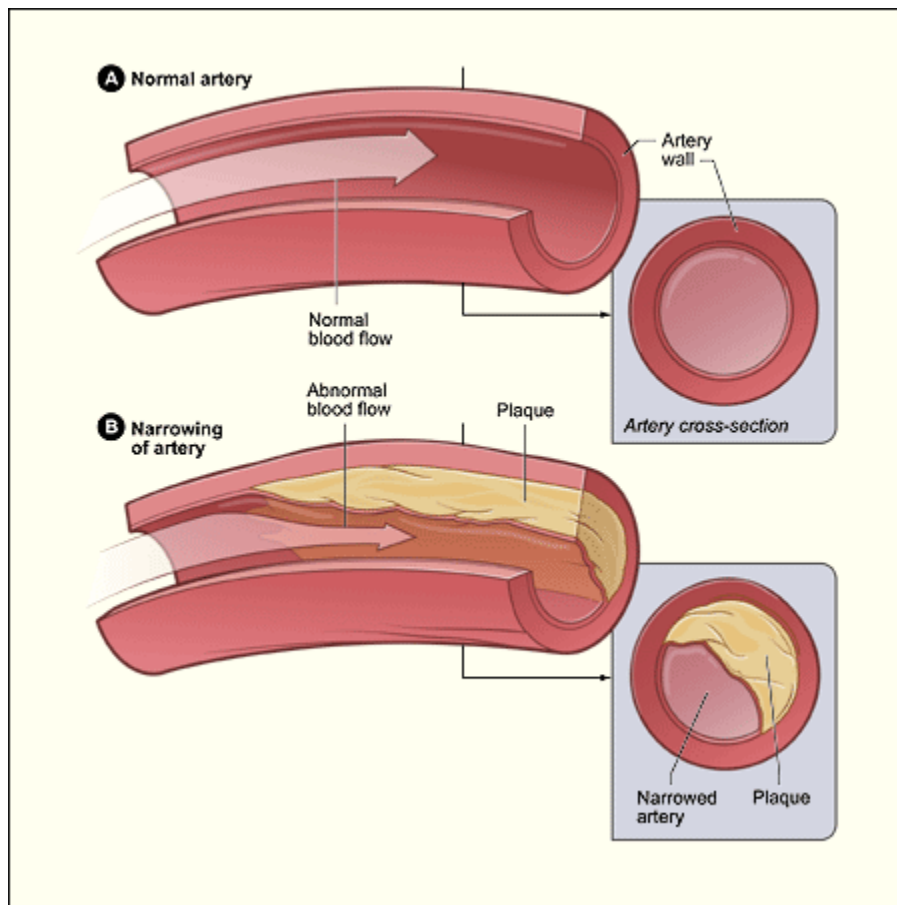
Doppler ultrasound

Treatment

Your doctor will treat your atherosclerosis with lifestyle changes, medications, surgery or other procedures. You can lower your risk of heart disease by knowing and controlling your blood pressure, diabetes and blood cholesterol. It is also important to lead a healthy lifestyle by being smoke-free, physically active, eating a healthy diet that is lower in fat, especially saturated and trans fat, achieving and maintaining a healthy weight, limiting alcohol use and reducing your stress.

You may be prescribed a medication to reduce fats and cholesterol in your blood or medications to control your blood pressure. Sometimes antiplatelets or anticoagulants may be prescribed to reduce your risk of developing a blood clot.

Your doctor may suggest that you undergo certain procedures to treat your condition. They may include:
Percutaneous coronary intervention (PCI or angioplasty with stent) Coronary artery bypass surgery



Heart Attack

A heart attack occurs if the flow of oxygen-rich blood to a section of heart muscle suddenly becomes blocked. If blood flow isn't restored quickly, the section of heart muscle begins to die. Heart attacks are a leading killer of both men and women in the North America.

Causes

Heart attacks most often occur as a result of coronary heart disease (CHD), also called coronary artery disease. CHD is a condition in which a waxy substance called plaque (plak) builds up inside the coronary arteries. These arteries supply oxygen-rich blood to your heart.

When plaque builds up in the arteries, the condition is called atherosclerosis (ath-er-o-skler-O-sis). The buildup of plaque occurs over many years.

Eventually, an area of plaque can rupture (break open) inside of an artery. This causes a blood clot to form on the plaque's surface. If the clot becomes large enough, it can mostly or completely block blood flow through a coronary artery.

If the blockage isn't treated quickly, the portion of heart muscle fed by the artery begins to die. Healthy heart tissue is replaced with scar tissue. This heart damage may not be obvious, or it may cause severe or long-lasting problems.

Heart With Muscle Damage and a Blocked Artery

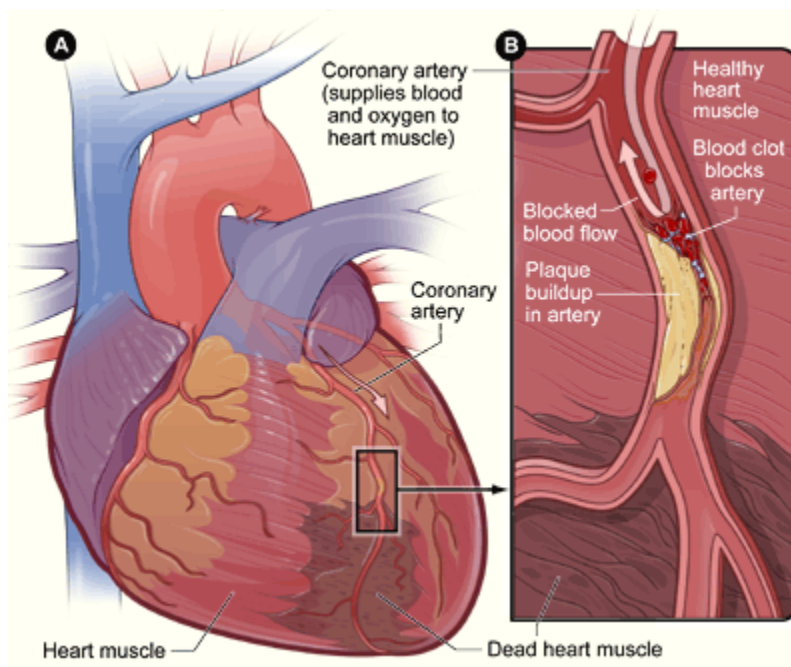


Figure A shows a heart with dead heart muscle caused by a heart attack. Figure B is a cross-section of a coronary artery with plaque buildup and a blood clot.

Symptoms

Acting fast at the first sign of heart attack symptoms can save your life and limit damage to your heart. Treatment works best when it's given right after symptoms occur.

Heart attack symptoms include:

- Chest pain or discomfort. This involves uncomfortable pressure, squeezing, fullness, or pain in the center or left side of the chest that can be mild or strong. This discomfort or pain often lasts more than a few minutes or goes away and comes back.
- Upper body discomfort in one or both arms, the back, neck, jaw, or upper part of the stomach.
- Shortness of breath, which may occur with or before chest discomfort.
- Nausea (feeling sick to your stomach), vomiting, light-headedness or sudden dizziness, or breaking out in a cold sweat.

Treatment

Nitroglycerin and morphine may be given to help reduce chest pain.

Angioplasty is a procedure to open narrowed or blocked blood vessels that supply blood to the heart. Usually a small, metal mesh tube called a stent is placed at the same time.

- Angioplasty is often the first choice of treatment. It should be done within 90 minutes after you get to the hospital, and no later than 12 hours after a heart attack.
- A stent is a small, metal mesh tube that opens up (expands) inside a coronary artery. A stent is often placed after angioplasty. It helps prevent the artery from closing up again.

Medications may be given to break up the clot. It is best if these drugs are given within 3 hours of first felt the chest pain. This is called thrombolytic therapy.

Some patients may also have heart bypass surgery to open narrowed or blocked blood vessels that supply blood to the heart. This procedure is also called open heart surgery.

After Heart Attack:

- Antiplatelet drugs (blood thinners) such as aspirin, clopidogrel (Plavix), or warfarin (Coumadin), to help keep your blood from clotting
 - Beta-blockers and ACE inhibitor medicines to help protect your heart
 - Statins or other drugs to improve your cholesterol levels
 - Slowly increase your exercise level
 - Learn how to follow a healthy lifestyle
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Coronary artery disease

Coronary artery disease (CAD) is the most common form of heart disease. It occurs when arteries in the heart are blocked, leading to complications including:

- Angina (chest pain) if the heart does not have enough oxygen; or
- Heart attack if the heart does not get any oxygen at all. During a heart attack, some of the heart muscle can die from a lack of oxygen.

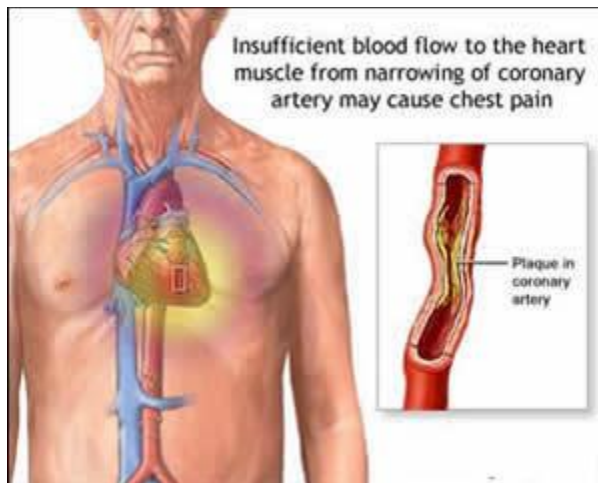
Causes

Over many years, plaque builds up on artery walls. Plaque is a sticky, yellow substance made of fatty substances like cholesterol, as well as calcium and waste products from your cells. It narrows and clogs the arteries, slowing the flow of blood. This condition is called atherosclerosis, which may begin as early as childhood. It can occur anywhere in the body, but it usually affects large and medium-sized arteries.

Sometimes plaque in an artery can rupture. The body's repair system in turn creates a blood clot to heal the wound. The clot, however, can block the artery, leading to either a heart attack or stroke.

Symptoms

Early warning signs may include: fatigue, pain and dizziness. They can also include the symptoms associated with angina: a squeezing, suffocating or burning feeling in your chest that tends to start in the centre of your chest but may move to your arm, neck, back, throat or jaw. Women are more likely to experience atypical symptoms such as vague chest discomfort. If left untreated, CAD can lead to other serious problems such as heart attack, stroke or even death.



Diagnosis

A doctor will start by taking a medical history, doing a physical exam and ordering some chest X-rays. Angiography, Echocardiogram, Electrocardiogram (ECG/EKG)

Treatment

There is no cure for CAD, but there are many treatments, including medications, surgery and lifestyle changes, that can slow down its progress.

Medications used to treat coronary artery disease include:

Anti-platelets
ACE inhibitors
Beta-blockers
Calcium channel blockers
Nitrates (Nitroglycerin)

Surgical and non-surgical procedures:

Percutaneous coronary intervention (PCI or angioplasty with stent)
Coronary artery bypass surgery

Lifestyle

Risk of coronary artery disease can be lowered by knowing and controlling your blood pressure, diabetes and blood cholesterol. It is also important to lead a healthy lifestyle by being smoke-free and physically active, eating a healthy diet that is lower in fat, especially saturated and trans fat, achieving and maintaining a healthy weight, limiting alcohol use and reducing your stress.

Angina

Angina (sometimes called angina pectoris) occurs when your heart doesn't get as much blood and oxygen as it needs due to a blockage of one or more of the heart's arteries (coronary arteries). This blockage causes pain in the chest. People who have angina describe the pain as a squeezing, suffocating or burning feeling.

A warning signal

Angina is not a heart attack. It is a warning signal that you are at increased risk of a heart attack, cardiac arrest or sudden cardiac death. Usually, the pain will go away with rest or medication, but it is your heart telling you that your body is working too hard and needs to slow down. Angina is a warning to you to stop what you are doing and rest. If you experience this kind of chest pain, see your doctor to determine the cause and get treatment if necessary.

Causes

Angina is the pain you feel when one or more of your coronary arteries becomes damaged, blocked or narrowed and isn't able to bring enough oxygen-rich blood to your heart. The pain may occur during physical activity, exercise, stress, periods of extreme cold or hot temperatures, after heavy meals, while drinking alcohol or smoking.

Angina is most often caused by:

- **Coronary artery disease** as a result of atherosclerosis, a build-up of fatty deposits that block the flow of blood through the coronary arteries.
- **Coronary artery spasm** one of the blood vessels supplying the heart muscle vigorously contracts, causing blood flowing to the part of the heart supplied by the artery to decrease or even stop, resulting in a heart attack.

In some cases angina can be caused by uncontrolled high blood pressure, or other heart conditions such as narrowing of one of the valves in the heart (aortic stenosis) or an enlarged heart (hypertrophic cardiomyopathy). Sometimes, people can have chest pain that is the result of other health conditions such as lung problems, muscle problems or bone problems.

Symptoms

Angina is usually a symptom of coronary artery disease (CAD) and puts you at risk of having a heart attack. Symptoms of angina are often experienced after exertion or emotional stress and are relieved with rest or medication. Symptoms of angina include:

- Pain that starts in the centre of your chest, but spreads to your left arm, neck, back, throat or jaw.
- Tightness, pressure, squeezing and/or aching feeling in your chest or arm(s).
- Feeling of moderate to severe indigestion that is persistent.
- Sharp, burning or cramping pain.
- An ache starting in, or spreading to, your neck, jaw, throat, shoulder, back or arm(s).
- Discomfort in your neck or upper back, particularly between the shoulder blades.

- Numbness or a loss of feeling in your arms, shoulders or wrists.

Treatment

Lifestyle changes and medications are the most common ways to treat and control angina. Sometimes, surgery may be necessary.

Although exercise may bring on angina, you'll still need to stay physically active, as long as your doctor approves. You could live more comfortably and with fewer angina attacks by controlling your risk factors such as blood pressure, diabetes and high blood cholesterol, and by eating a healthy diet, being smoke-free, limiting alcohol use and reducing stress.

Medications

Certain medications may help prevent or relieve the symptoms of angina.

Anti-platelets

Beta-blockers

Calcium channel blockers

Nitroglycerin

Surgical and other procedures

Angina can also be treated by widening or bypassing the narrowed artery to increase the blood flow to your heart. Procedures to treat angina might include:

Percutaneous coronary intervention (PCI or angioplasty with stent)

Coronary artery bypass surgery

Stroke

A stroke happens when blood flow to a part of the brain stops. A stroke is sometimes called a "brain attack." There are two major types of stroke: ischemic stroke and haemorrhagic stroke.

Causes

If blood flow is stopped for longer than a few seconds, the brain cannot get blood and oxygen. Brain cells can die, causing permanent damage.

Ischemic stroke occurs when a blood vessel that supplies blood to the brain is blocked by a blood clot. This may happen in two ways:

- A clot may form in an artery that is already very narrow. This is called a *thrombotic stroke*.
- A clot may break off from another place in the blood vessels of the brain, or from some other part of the body, and travel up to the brain. This is called cerebral embolism, or an *embolic stroke*.

Ischemic strokes may be caused by clogged arteries. Fat, cholesterol, and other substances collect on the artery walls, forming a sticky substance called plaque.

A haemorrhagic stroke occurs when a blood vessel in part of the brain becomes weak and bursts open, causing blood to leak into the brain. Some people have defects in the blood vessels of the brain that make this more likely.

Risk Factors

High blood pressure is the number one risk factor for strokes. The other major risk factors are: Diabetes, Family history of stroke, High cholesterol, Increasing age, especially after age 55, Race (black people are more likely to die of a stroke). People who have heart disease or poor blood flow in their legs caused by narrowed arteries are also more likely to have a stroke.

The chance of stroke is higher in people who live an unhealthy lifestyle by: Being overweight or obese, Drinking heavily, Eating too much fat or salt, Smoking, Taking other illegal drugs

Birth control pills can increase the chances of having blood clots. The risk is highest in woman who smoke and are older than 35.

Symptoms

The symptoms of stroke depend on what part of the brain is damaged. In some cases, a person may not know that he or she has had a stroke.

Symptoms usually develop suddenly and without warning. Or, symptoms may occur on and off for the first day or two. Symptoms are usually most severe when the stroke first happens, but they may slowly get worse.

A [headache](#) may occur, especially if the stroke is caused by bleeding in the brain. The headache:

- Starts suddenly and may be severe
- Occurs when you are lying flat
- Wakes you up from sleep
- Gets worse when you change positions or when you bend, strain, or cough

Other symptoms depend on how severe the stroke is and what part of the brain is affected.

Symptoms may include:

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|---|--|
| • Change in alertness | • Lack of control over the bladder or bowels |
| • Changes in hearing | • Loss of balance |
| • Changes in taste | • Loss of coordination |
| • Changes that affect touch and the ability to feel pain, pressure, or different temperatures | • Muscle weakness in the face, arm, or leg (usually just on one side) |
| • Clumsiness | • Numbness or tingling on one side of the body |
| • Confusion or loss of memory | • Personality, mood, or emotional changes |
| • Difficulty swallowing | • Problems with eyesight, including decreased vision, double vision, or total loss of vision |
| • Difficulty writing or reading | • Trouble speaking or understanding others who are speaking |
| • Dizziness or abnormal feeling of movement (vertigo) | • Trouble walking |

Treatment

Clot-busting drugs (thrombolytic therapy) may be used if the stroke is caused by a blood clot. This medicine breaks up blood clots and helps bring back blood flow to the damaged area. However, not everyone can get this type of medicine.

- For these drugs to work, a person must be seen and treatment must begin within 3 hours of when the symptoms first started. A CT scan must be done to see whether the stroke is from a clot or from bleeding.
- If the stroke is caused by bleeding instead of clotting, clot-busting drugs (thrombolytics) can cause more bleeding.

Other treatments depend on the cause of the stroke:

- Blood thinners such as heparin or warfarin (Coumadin) may be used to treat strokes due to blood clots. Aspirin or clopidogrel (Plavix) may also be used.
- Other medicine may be needed to control symptoms such as high blood pressure.
- In some situations, a special stroke team and skilled radiologists may be able to use angiography to highlight the clogged blood vessel and open it up.
- If bleeding occurred, surgery is often needed to remove blood from around the brain and to fix damaged blood vessels.
- Surgery on the carotid artery may be needed.

**Appendix: B4 – Blood Vessel Disease
Summary Table**

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Disease:		
Symptoms:	Causes:	Treatment:

Disease:		
Symptoms:	Causes:	Treatment:

